इंटरनेट मानक

Disclosure to Promote the Right To Information

Whereas the Parliament of India has set out to provide a practical regime of right to information for citizens to secure access to information under the control of public authorities, in order to promote transparency and accountability in the working of every public authority, and whereas the attached publication of the Bureau of Indian Standards is of particular interest to the public, particularly disadvantaged communities and those engaged in the pursuit of education and knowledge, the attached public safety standard is made available to promote the timely dissemination of this information in an accurate manner to the public.

"जानने का अधिकार, जीने का अधिकार"
Mazdoor Kisan Shakti Sangathan
"The Right to Information, The Right to Live"

"पुराने को छोड नये के तरफ"
Jawaharlal Nehru
"Step Out From the Old to the New"

IS 2000-2 (1985): Methods of chemical analysis of bauxite, Part 2: Determination of silica [MTD 13: Ores and Raw Materials]

"ज्ञान से एक नये भारत का निर्माण"
Satyanarayan Gangaram Pitroda
"Invent a New India Using Knowledge"

Act Number 22 of 2005
The Indian Parliament
RIGHT TO INFORMATION

Made Available By
Public.Resource.Org

"ज्ञान एक ऐसा खजाना है जो कभी चुराया नहीं जा सकता है"
Bhartṛhari—Nītiśatakam
"Knowledge is such a treasure which cannot be stolen"

BLANK PAGE

BRUTUM FULMEN

IGNORANTIA JURIS NON EXCUSAT

PROTECTED BY COPYRIGHT

IS : 2000 (Part 2) - 1985
(Reaffirmed 2001)

Indian Standard

METHODS OF
CHEMICAL ANALYSIS OF BAUXITE

PART 2 DETERMINATION OF SILICA

(First Revision)

UDC 622·349·21 : 543 : 546·284-31

© *Copyright* 1986

INDIAN STANDARDS INSTITUTION
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

Gr 2

July 1986

Indian Standard

METHODS OF CHEMICAL ANALYSIS OF BAUXITE

PART 2 DETERMINATION OF SILICA

(First Revision)

Methods of Chemical Analysis of Ores, Minerals and Refractories Sectional Committee, SMDC 35

Chairman	*Representing*
Dr L. P. Pandey	National Metallurgical Laboratory (CSIR), Jamshedpur
Members	
Dr V. M. Chowdhury (*Alternate* to Dr L. P. Pandey)	
Shri G. M. Appa Rao	Steel Authority of India Ltd (Bhilai Steel Plant), Bhilai
Shri C. L. Sharma (*Alternate*)	
Shri J. Banerjee	Steel Authority of India Ltd (Durgapur Steel Plant), Durgapur
Shri A. C. Mallick (*Alternate*)	
Shri S. V. Bhagwat	Khandelwal Ferro Alloys Ltd, Khandelwal Nagar
Shri D. N. Gupta (*Alternate*)	
Shri P. Bhattacharya	Belpahar Refractories Ltd, Belpahar
Shri P. V. Rao (*Alternate*)	
Shri P. K. Ghosal	Kumardhubi Fireclay and Silica Works Ltd, Kumardhubi
Shri L. N. Banerjee (*Alternate*)	
Shri N. B. Gude	Chowgule & Co Pvt Ltd, Marmugao Harbour
Shri S. S. Honavar	Italab Pvt Ltd, Madras
Shri M. V. Dahholkar (*Alternate* I)	
Shri J. C. Dey (*Alternate* II)	
Dr C. S. P. Iyer	Chairman, SMDC 2 (Bhabha Atomic Research Centre, Bombay)
Shri J. R. K. Murthy	Harry Refractories & Ceramic Works Pvt Ltd, Calcutta
Shri N. C. Saha (*Alternate*)	
Dr A. Purusottam	Geological Survey of India, Calcutta
Shri M. Rae	National Test House, Calcutta
Shri A. K. Dutta Gupta (*Alternate*)	

(*Continued on page* 2)

© *Copyright* 1986
INDIAN STANDARDS INSTITUTION
This publication is protected under the *Indian Copyright Act* (XIV of 1957) and reproduction in whole or in part by any means except with written permission of the publisher shall be deemed to be an infringement of copyright under the said Act.

(*Continued from page* 1)

Members	*Representing*
Dr J. Rajaram	Essen & Co, Bangalore
Shri K. Rama Krishna (*Alternate*)	
Shri G. Raja Rao	Ferro Alloys Corporation Ltd, Shreeramnagar
Shri D. V. Raman	National Mineral Development Corporation Ltd, Hyderabad
Shri N. Venkatraman (*Alternate*)	
Shri K. Syamala Rao	Mineral Exploration Corporation Ltd, Nagpur
Dr B. C. Sinha	Central Glass & Ceramic Research Institute (CGCRI), Calcutta
Shri S. Das Gupta (*Alternate*)	
Dr Y. P. Srivastava	The Tata Iron & Steel Co Ltd, Jamshedpur
Dr K. S. R. Krishnaiah (*Alternate*)	
Shri B. N. Tikoo	Department of Atomic Energy, Hyderabad
Dr Ch Venkateswarlu	Chairman, SMDC 34 (Bhabha Atomic Research Centre, Bombay)
Shri K. Raghavendran, Director (Struc & Met)	Director General, ISI (*Ex-officio Member*)

Secretaries

Shri Jagmohan Singh
Deputy Director (Metals), ISI

Shri M. L. Sharma
Assistant Director (Metals), ISI

Indian Standard

METHODS OF CHEMICAL ANALYSIS OF BAUXITE

PART 2 DETERMINATION OF SILICA

(First Revision)

0. FOREWORD

0.1 This Indian Standard (Part 2) (First Revision) was adopted by the Indian Standards Institution on 24 December 1985, after the draft finalized by the Methods of Chemical Analysis of Ores, Minerals and Refractories Sectional Committee had been approved by the Structural and Metals Division Council.

0.2 IS : 2000-1962* which covered determination of loss on ignition; total silica, non-reactive and reactive silica; alumina; ferric oxide by dichromate method, permanganate and colorimetric methods; titania by reduction (volumetric) and colorimetric methods; phosphorus; calcium oxide; magnesium oxide and manganous oxide was first published in 1962. While reviewing this standard the Sectional Committee felt the need for the revision of this standard. On the basis of experience gained during these years the Committee decided to revise this standard into different parts covering determination of each element in a separate part, which on publication would supersede that element given in IS : 2000-1962*. This part covers determination of silica. The other parts are:

Part 1 Determination of loss on ignition
Part 3 Determination of alumina
Part 4 Determination of ferric oxide
Part 5 Determination of titania (0·5 to 12·0 percent)
Part 6 Determination of vanadium ($V <$ 0·1 percent)
Part 7 Determination of phosphorus pentoxide ($P_2O_2 <$ 0·5 percent)
Part 8 Determination of manganous oxide ($MnO <$ 0·5 percent)

The procedures for determination of CaO and MgO in bauxite are at present under investigation and will be given in subsequent part.

---

*Methods of chemical analysis of bauxite.

0.3 In this revision determination of non-reactive and reactive silica have been deleted. Gravimetric method has been retained and updated.

0.4 In preparation of this revision due consideration has been given to the facilities available in the country to carry out such analysis.

0.5 In reporting the results of a test or analysis made in accordance with this standard, if the final value, observed or calculated, is to be rounded off, it shall be done in accordance with IS : 2-1960*.

1. SCOPE

1.1 This standard (Part 2) covers the determination of silica (as SiO_2) in bauxite in the range of 0·5 to 10·0 percent (m/m).

2. SAMPLING

2.1 Sample shall be drawn and prepared as per the method prescribed in clause 2 of IS : 2000 (Part 1)-1986†.

3. GENERAL

3.1 Use of Filter Papers — In this standard Whatman filter papers with their relative numbers have been prescribed since they are commonly used. However, any other suitable brand of filter paper of corresponding porosity and of equivalent quality may also be used.

4. QUALITY OF REAGENTS

4.1 Unless specified otherwise, analytical grade reagents and distilled water shall be employed in the test.

5. DETERMINATION OF SILICA BY THE GRAVIMETRIC METHOD

5.1 Outline of the Method — The sample is decomposed with an acid mixture and evaporated to fumes. The fumed mass is extracted with water, boiled to dissolve the salts and filtered. The residue is ignited and silica is determined through hydrofluorization.

5.2 Reagents

5.2.1 *Concentrated Sulphuric Acid* — rd = 1·84 (conforming to IS : 266-1977‡).

---

*Rules for rounding off numerical values (*revised*).

†Methods of chemical analysis of bauxite: Part 1 Determination of loss on ignition (*first revision*).

‡Specification for sulphuric acid (*second revision*).

5.2.2 *Concentrated Nitric Acid* — rd = 1·42 (conforming to IS : 264-1976*).

5.2.3 *Concentrated Hydrochloric Acid* — rd = 1·16 (conforming to IS : 265-1976†).

5.2.4 *Mixed Acids* (*Freshly Prepared*) — Add slowly 150 ml of concentrated sulphuric acid to 450 ml of water while stirring cool and add 200 ml of concentrated hydrochloric acid and 200 ml of concentrated nitric acid.

5.2.5 *Dilute Sulphuric Acid* — 1 : 20 (*v/v*) and 1 : 4 (*v/v*).

5.2.6 *Sulphuric Acid Washing Solution* — 1 : 25 (*v/v*).

5.2.7 *Sodium Carbonate* — Anhydrous.

5.2.8 *Hydrofluoric Acid* — 40 percent.

5.3 Procedure

5.3.1 Transfer 1·00 g of accurately weighed sample (*see* **2.1**) to a 400 ml pyrex beaker. Add 100 ml of freshly prepared mixed acids, cover heat at low heat till the brown fumes have disappeared. Remove the cover and wash the sides of beaker with little water. Continue heating until the fumes of sulphur trioxide (SO_3) are given off. After cooling to room temperature add about 100 ml of dilute sulphuric acid (1 : 20) and bring to boiling temperature on a hot plate and continue boiling till the sulphates goes in the solution leaving silica and if any unattacked sample. Allow to settle, filter (use Whatman filter No. 40 with pulp) and wash the residue and the filter paper with hot washing solution until free from dissolved salts, collect the filtrated and washings in 500-ml beaker (Solution A).

5.3.2 Transfer the filter paper in a platinum crucible, ignite in a furnace. Cool the ignited residue (containing a little of undissolved sample and silica) and mix with 2 g of sodium carbonate. Cover the platinum crucible with lid, heat slowly on low gas flame in the beginning and increase the temperature with intermittent swirling of the sample. Finally put the lid and keep in a furnace at 1 000°C for about 15 minutes. Remove and cool the crucible to room temperature and dip the crucible along with lid in the beaker containing main solution A. The cake is disintegrated with glass rod and removed from the crucible. Wash the crucible and lid and collect the washings in the sample Solution A. The main solution slowly to be evaporated and continue heating till the fumes of sulphur trioxide (SO_3) are given off. Cool add 100 ml of dilute sulphuric acid (1 : 20) from the sides of beaker and bring to

---

*Specification for nitric acid (*second revision*).

†Specification for hydrochloric acid (*second revision*).

boiling on a hot plate to dissolve all the solids other than dehydrated silica. Allow to settle, filter (use Whatman filter paper No. 40 with pulp) and wash the residue and the filter paper with hot washing solution until free from dissolved salts. Collect the filtrate and washings in 500-ml volumetric flask (Solution A). Transfer the filter paper to a platinum crucible, ignite in furnace to constant mass at 950 to 1 000°C, cool in a desiccator and weigh. Moisten the precipitate with a few drops of water, add 1 to 2 ml of dilute sulphuric acid (1 : 4) and 10 ml of hydrofluoric acid, evaporate slowly to dryness at a low heat. Repeat the process with the addition of 2 to 5 ml of hydrofluoric acid and evaporate slowly to dryness. Ignite in a furnace at 950 to 1 000°C for 5 to 10 minutes, cool in a desiccator and weigh. Preserve the residue.

5.3.3 Carry out a blank determination following the same procedure and using the same quantity of all reagents without the sample.

5.3.4 *Preparation of Main Solution* — Fuse the residue preserved under **5.3.2** thoroughly with about 1 g of sodium carbonate extract with 20 to 30 ml of dilute sulphuric acid (1 : 20). Add the extract to the filtrate and washings (Solution *A*) obtained under **5.3.1** and make up the volume up to the mark with water and mix thoroughly.

5.4 Calculation

$$\text{Silica, percent} = \frac{(A - B) - C}{D} \times 100$$

where

A = mass in g of platinum crucible with the residue before volatilization;

B = mass in g of platinum crucible with the residue obtained after repeated volatilization with HF;

C = mass in g of silica obtained from the blank determination; and

D = mass in g of the sample taken.

INDIAN STANDARDS INSTITUTION

Headquarters:

Manak Bhavan, 9 Bahadur Shah Zafar Marg, NEW DELHI 110002

Telephones : 331 0131 331 1375

Telegrams : Manaksanstha
(Common to all Offices)

Regional Offices:	*Telephone*
*Western : Manakalaya, E9 MIDC, Marol Andheri (East) BOMBAY 400093	6 32 92 95
†Eastern : 1/14 C. I. T. Scheme VII M. V. I. P. Road, Maniktola, CALCUTTA 700054	36 24 99
Northern : SCO 445-446, Sector 35-C CHANDIGARH 160036	2 18 43 3 16 41
Southern : C. I. T. Campus, MADRAS 600113	41 24 42 41 25 19 41 29 16
Branch Offices:	
'Pushpak', Nurmohamed Shaikh Marg, Khanpur AHMADABAD 380001	2 63 48 2 63 49
'F' Block, Unity Bldg, Narasimharaja Square, BANGALORE 560002	22 48 05
Gangotri Complex, 5th Floor, Bhadbhada Road, T. T. Nagar, BHOPAL 462003	6 67 16
Plot No. 82/83, Lewis Road, BHUBANESHWAR 751002	5 36 27
53/5 Ward No. 29, R. G. Barua Road, 5th Byelane, GUWAHATI 781003	—
5-8-56C L. N. Gupta Marg, HYDERABAD 500001	22 10 83
R14 Yudhister Marg, C Scheme, JAIPUR 302005	6 34 71 6 98 32
117/418 B Sarvodaya Nagar, KANPUR 208005	21 68 76 21 82 92
Patliputra Industrial Estate, PATNA 800013	6 23 05
Hantex Bldg (2nd Floor), Rly Station Road, TRIVANDRUM 695001	52 27
Inspection Office (With Sale Point):	
Institution of Engineers (India) Building, 1332 Shivaji Nagar, PUNE 411005	5 24 35

---

*Sales Office in Bombay is at Novelty Chambers, Grant Road, BOMBAY 400007 — 89 65 28

†Sales Office in Calcutta is at 5 Chowringhee Approach, P.O. Princep Street, CALCUTTA 700072 — 27 68 00

Printed at Printograph, New Delhi, India